10

## We claim:

(

- 1. An isolated nucleic acid molecule encoding a polypeptide having GRF4 activity.
- The nucleic acid molecule of claim 1, comprising all or part of the nucleic acid molecule of [SEQ ID NO:1].
- An isolated nucleic molecule comprising at least 40% sequence identity to all or part of the nucleic acid molecule of [SEQ ID NO:1], wherein the nucleic acid molecule encodes a polypeptide having GRF4 activity.
  - 4. The molecule of any of claims 1 to 3 which is selected from a group consisting of mRNA, cDNA, sense DNA, anti-sense DNA, single-stranded DNA and double-stranded DNA.
  - 5. A nucleic acid molecule encoding the amino acid sequence of [SEQ ID NO:2].
  - 6. A nucleic acid molecule that encodes all or part of a GRF4 polypeptide or a polypeptide having GRF4 activity, wherein the sequence hybridizes to the nucleic acid molecule of all or part of [SEQ ID NO:1] under high stringency conditions.
  - 7. The nucleic acid molecule of claim 6, wherein the high stringency conditions comprise a wash stringency of about 0.2X SSC, about 0.1% SDS, at about 50-65°C.
  - 8. An isolated polypeptide having GRF4 activity and a CDC25 domain.
  - The polypeptide of claim 8, comprising all or part of the sequence of [SEQ ID NO:2].
  - 10. An isolated polypeptide comprising at least 40% sequence identity to all or part of the polypeptide of [SEQ ID NO:2], wherein the polypeptide has GRF4 activity.
  - 11. A mimetic of the isolated polypeptide of any of claims 8 to 10, wherein the mimetic has GRF4 activity.
- A recombinant nucleic acid molecule comprising a nucleic acid molecule of any of claim 1 to claim 7 and a promoter region, operatively linked so that the promoter enhances transcription of the nucleic acid molecule in a host cell.
  - 13. A system for the expression of GRF4, comprising an expression vector and a nucleic acid molecule of any of claim 1 to claim 7 inserted in the expression vector.
- 30 14. The system of claim 13, wherein the expression vector comprises a plasmid or a virus.
  - 15. A cell transformed by the expression vector of claim 14.

5

- 16. A method for expressing a polypeptide comprising: transforming an expression host with an expression vector including and culturing the expression host.
- 17. The method of claim 16, further comprising isolating the polypeptide.
- 18. The method of claim 16 or 17, wherein the expression host is selected from the group consisting of a plant, plant cell, bacterium, yeast, fungus, protozoa, algae, animal and animal cell.
  - 19. A pharmaceutical composition, comprising all or part of the polypeptide or mimetic of any of claims 8 to 11, and a pharmaceutically acceptable carrier, auxiliary or excipient
- 10 20. A GRF4 specific antibody targeted to a region selected from the group consisting of the C-terminus, the CDC25 domain, the cNMP binding domain and the PDZ domain.
  - 21. The antibody of claim 20, wherein the antibody is a monoclonal antibody or a polyclonal antibody.
  - 22. A method of medical treatment of a disease, disorder or abnormal physical state, characterized by excessive GRF4 expression, concentration or activity, comprising administering a product that reduces or inhibits GRF4 polypeptide expression, concentration or activity.
  - 23. The method of claim 22, wherein the product is an antisense nucleic acid molecule to all or part of the nucleic acid molecule of any of claims 1 to 7, the antisense nucleic acid molecule being sufficient to reduce or inhibit GRF4 polypeptide expression.
  - 24. The method of claim 22, wherein the product comprises all or part of Nedd4.
- The method of any of claims 22 to 24 wherein the disease, disorder or abnormal physical state comprises cancer.
  - 26. A method of medical treatment of a disease, disorder or abnormal physical state, characterized by inadequate GRF4 expression, concentration or activity, comprising administering a product that increases GRF4 polypeptide expression, concentration or activity.
- The method of claim 26, wherein the product is a nucleic acid molecule comprising all or part of the nucleic acid molecule of any of claims 1 to 7, the DNA being sufficient to increase GRF4 polypeptide expression.

(

25

30

10

- 28. The method of claim 27, wherein the nucleic acid molecule is administered in a pharmaceutical composition comprising a carrier and a vector operably linked to the nucleic acid molecule.
- A method of identifying a compound which modulates the interaction of GRF4 with
  Ras, comprising
  - a) contacting (i) GRF4, a Ras-binding fragment of GRF4 or a derivative of either of the foregoing with (ii) Ras, a GRF4-binding fragment of Ras or a derivative of either of the foregoing in the presence of the compound; wherein (i) and (ii) are capable of binding; and
  - b) determining whether the binding between (i) and (ii) is modulated, thereby indicating that the compound modulates the interaction of GRF4 and Ras.
  - 30. A method of identifying a compound which modulates the interaction of GRF4 with Rap1, comprising
    - a) contacting (i) GRF4, a Rap1-binding fragment of GRF4 or a derivative of either of the foregoing with (ii) Rap1, a GRF4-binding fragment of Rap1 or a derivative of either of the foregoing in the presence of the compound; wherein (i) and (ii) are capable of binding; and
    - b) determining whether the binding between (i) and (ii) is modulated, thereby indicating that the compound modulates the interaction of GRF4 and Rap1.
  - 31. A method of evaluating the cell proliferation reducing properties of a compound comprising contacting the compound with:
    - a) GRF4, a Ras binding fragment of GRF4 or a derivative of either of the foregoing; and
    - b) Ras, a GRF4 binding fragment of Ras or a derivative of either of the foregoing; wherein (a) and (b) are capable of binding; and
    - c) determining the ability of the compound to interfere with the binding of a) with b), the ability to interfere with binding indicating that the compound reduces cell proliferation.
  - 32. An isolated Guanine Nucleotide Releasing Factor 4 (GRF4) polypeptide Ras activator.
    - 33. A recombinant GRF4 protein produced by a cell including a nucleic acid molecule encoding a GRF4, operably linked to a promoter.

- 34. A Ras binding peptide comprising 10 to 100 amino acids wherein the peptide includes part of the peptide of [SEQ. ID NO.2, 4, 5 or 6] or a derivative thereof and inhibits Ras activation.
- 35. A method of evaluating an anti-proliferative compound comprising contacting the compound with the CDC25 domain of GRF4, or a derivative thereof and determining the ability of the compound to bind to the GRF4 or derivative, wherein the ability to bind indicates that the compound inhibits cell proliferation.

5